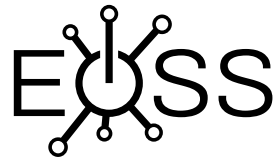


Automated testing of Embedded Web Applications

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EMBEDDED
OPEN SOURCE
SUMMIT

About me

- At Igalia since 2020
- WebKit team
 - QA, WebDriver
- Other work done in the past:
 - EFL (JS and C# bindings)
 - Maemo (Python bindings, Nix WebKit port)



About Igalia

- Specialized **Open Source consultancy**, founded in 2001
- **Fully remote**, HQ in **A Coruña** (Spain). **Flat structure**.
- **Top contributors** to all the main **Web Rendering Engines**
 - WebKit, Chromium, Gecko and Servo
- **Active contributor to other areas and OSS projects**
 - V8, SpiderMonkey, JSC, LLVM, Node.js, GStreamer, Mesa, Linux Kernel...
- **Members of several working groups:**
 - W3C, WHATWG, WPT, TC39, OpenJS, Test262, Khronos...



Automated testing for Web-based embedded systems

Lauro Moura, 2023-04-18



Agenda

- Embedded Web Apps
- Some Challenges in Web Apps
- Challenges of Embedded Web Apps
- Browser automation overview
- Browser automation tools



Web Applications

"Write once, run anywhere!"



Web Applications

- Fast development cycles
- Fast deployment
- Large ecosystem



Web Apps in real life

"Write once, run **_mostly_** anywhere!"

"Works better with **\$BROWSER**"



Why does this happen?

- Engine differences: Blink vs WebKit vs Gecko
- Browser differences: Chrome vs Brave vs Edge, Safari vs GNOME Web
- Versioning: Canary, Stable, ESR
- **Browser engines != Desktop browsers != Mobile browsers**



It's also about hardware

- Desktop? Tablet? Phone?
- 4k? 1080p? Scaled or native resolution?
- What kind of interaction? Mouse? Gestures?



Embedded Web Applications

- Not just a generic site running on a generic mobile browser
- Load specific resources...
 - (e.g. using a local server)
- ... from specific browsers
- We can expand the browser with new APIs



Embedded Web Applications in real life

- But we might have different devices...
- ...with different hardware capabilities...
 - (e.g. different GPUs, screens)
- Or different browser versions
- Thankfully, still less variables



Other differences

- Generic websites are usually sandboxed
- Embedded web apps might need to interact with the system
 - Testing the web app in a live system is a must



But how to test a web app?



Automation != Testing

- Automation is a tool
 - Crawling the web
 - Filing taxes
 - **Running test steps**



Originally, mimick user actions

- Navigate to \$URL
- Find input for value "name"
- Enter text "John Doe"
- Find button with label "Confirm"
- Click this button
- Search for message "User created"



Brief history of browser automation

- Early 2000's efforts
- Selenium + WebDriver = Selenium WebDriver
- W3C WebDriver standard in 2018
 - Supported by major browsers
 - WebDriver "Classic"
 - HTTP-based protocol (remote connections)



WebDriver Classic, under the hood

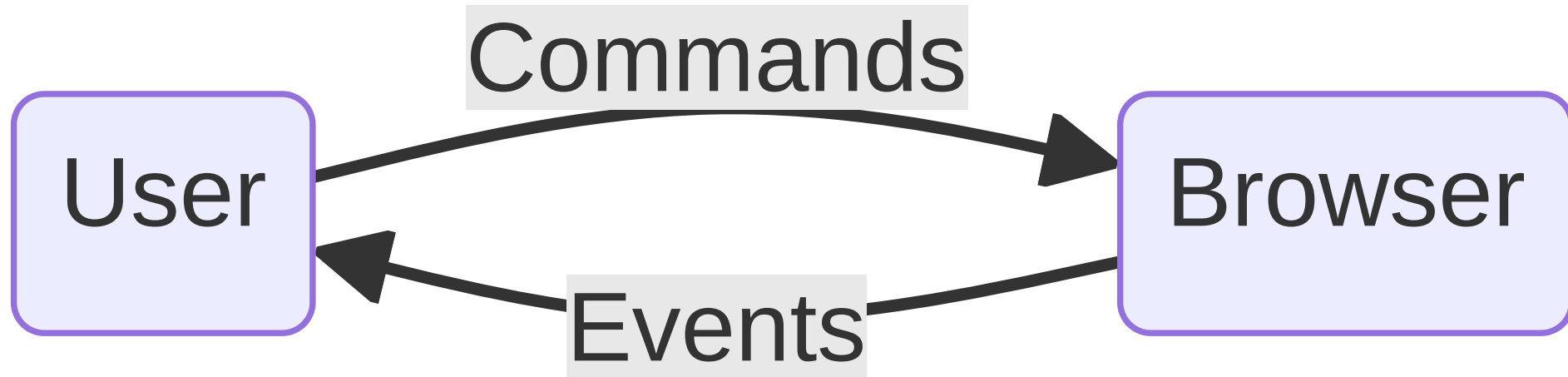


Mimicking the user is not enough

- Logic moving into the frontend
 - Asynchronous tasks
 - Polling is tricky
- Developer tools/inspectors evolution
 - Enabling two-way communication with the browser
- Automation tools based on these protocols
 - Browser-specific solutions?
- **W3C WebDriver BiDi** in active development \o/
 - WebKit support incoming



WebDriver BiDi, under the hood



WebDriver Bidi

- Based on WebSockets
- Extends WebDriver Classic
- Still perform user actions
- Monitor the browser state without polling
 - Monitor **log** messages
 - Observe **DOM** changes
 - Intercept and mock **network** requests



What about Browser Automation Tools?



Selenium

- One of the most well known tools around
- Deeply influenced the WebDriver standard
- JavaScript, Python, Java, Ruby, C#...
- Selenium Grid



WebDriverIO

- Also based on the W3C WebDriver
- Written in JavaScript
- Built-in support for Cucumber, Mocha and Jasmine test frameworks



Playwright

- Puppeteer background
- Developed by Microsoft
- Autowaits feature
- Depends on patched Firefox or WebKit, though...



Recap

Embedded Web Apps run in controlled scenarios

But testing how it integrates in the system is crucial

WebDriver BiDi features allows better testing of such apps



Questions?



Thank you!



